

Application No. 10/064,887
Docket No. 13DV-14039
Amendment dated February 2, 2004
Reply to Office Action of October 3, 2003

Amendments to the Specification:

Please replace the title of the invention at page 1 with the following amended title:

VAPOR DEPOSITION PROCESS AND APPARATUS
THEREFOR

Please replace the paragraph in the Abstract of the Disclosure with the amended paragraph submitted herewith on a separate sheet pursuant to 37 CFR 1.72.

Please replace paragraph [0005] with the following amended paragraph:

[0005] To reduce and stabilize the thermal conductivity of YSZ, ternary YSZ systems have been proposed. For example, commonly-assigned U.S. Patent No. 6,586,115 ~~Application Serial No. 09/833,446~~ to Rigney et al. discloses a TBC of YSZ alloyed to contain certain amounts of one or more alkaline-earth metal oxides (magnesia (MgO), calcia (CaO), strontia (SrO) and barium oxide (BaO)), rare-earth metal oxides (lanthana (La₂O₃), ceria (CeO₂), neodymia (Nd₂O₃), gadolinium oxide (Gd₂O₃) and dysprosia (Dy₂O₃)), and/or such metal oxides as nickel oxide (NiO), ferric oxide

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(Fe₂O₃), cobaltous oxide (CoO), and scandium oxide (Sc₂O₃). According to Rigney et al., when present in sufficient amounts these oxides are able to significantly reduce the thermal conductivity of YSZ by increasing crystallographic defects and/or lattice strains. In commonly-assigned U.S. Patent Application Serial No. 10/064,785 to Darolia et al., a TBC of YSZ is deposited to contain a third oxide, elemental carbon and potentially carbides and/or a carbon-containing gas. The resulting TBC is characterized by lower density and thermal conductivity, high temperature stability and improved mechanical properties.

Please replace paragraph [0019] with the following amended paragraph:

[0019] According to a preferred aspect of the invention, the thermal-insulating material of the TBC 26 is based on binary yttria-stabilized zirconia (YSZ), but alloyed to contain at least a third metal oxide. The invention particularly pertains to the deposition by evaporation of YSZ-based coatings in which one or more of the additional metal oxides have a vapor pressure that differs significantly from zirconia and yttria, e.g., at least an order of magnitude. Though not a necessary feature of the invention, the third oxide

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preferably has the effect of reducing and/or stabilizing the thermal conductivity of the TBC 32. For this purpose, and in accordance with commonly-assigned U.S. Patent No. 6,586,115 ~~Application Serial No. 09/833,446~~ to Rigney et al., the third oxide preferably has an absolute percent ion size difference relative to zirconium ions of at least that of an yttrium anion (Y^{3+}), i.e., at least 13 percent, so as to produce significant strains due to ionic size. In accordance with commonly-assigned U.S. Patent Application Serial No. 10/064,785 to Darolia et al., the TBC 32 may be further modified to contain elemental carbon in the form of precipitate clusters, from which may evolve a carbon-containing gas (e.g., carbon monoxide (CO) and/or carbon dioxide (CO₂)) as a result of thermal decomposition of carbon. In combination, the presence of elemental carbon clusters and one or more of the above-specified third metal oxides is believed to reduce the density and thermal conductivity of a YSZ TBC.